Cerebral 3D-Gadolinium-DSA in a Patient with Renal Insufficiency Presenting a Subarachnoid Haemorrhage

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Introduction

Contra-indications to iodinated contrast media injection are well-known and include patients with sensitivity to iodinated contrast medium, renal insufficiency, pregnancy, breast-feeding, diabetes mellitus treated by biguanides, and patients on beta-blockers [1,2]. When a digital subtracted angiography (DSA) is required in such patients, Gadolinium chelates have been successfully proposed as alternative contrast agents [3-12]. Cerebral 3D-DSA brings crucial information in the pre-therapeutic analysis of intracranial aneurysm and is therefore highly recommended when such an abnormality is encountered. We report here a case of a non-dialysed patient with renal failure due to polycystosis, who presented with a subarachnoid hemorrhage and underwent cerebral DSA and 3D-DSA with Gadolinium as the contrast agent, to seek for, assess and then embolize two cerebral aneurysms.

Case Report

A 47-year-old patient with a medical history of long-lasting high blood pressure, renal insufficiency due to a renal polycystosis and a right middle cerebral artery aneurysm clipped 25 years ago, was admitted to our institution with a Hunt and Hess score of 3. CT scan revealed a diffuse high-attenuated density in the left sylvian fissure and the left sulci corresponding to an acute subarachnoid hemorrhage, and showed the metallic clip placed 25 years ago in the right sylvian fissure. A diagnostic cerebral DSA was done with Gadolinium because of the renal insufficiency (creatininemia: 266 micromol/l) and demonstrated a left M1-M2 junction irregular aneurysm, probably at the origin of the bleeding.

In addition, another small and regular aneurysm on the left A2 segment and a dissection of the infrapetrous segment of the left carotid artery were incidentally discovered.

The left middle cerebral aneurysm was embolized with GDC coils, with a 80% occlusion. Five days later, a 3D (rotational)-Gadolinium-DSA was done to precisely assess the aneurysmal remnant and the A2 aneurysm (figure 1). 20 cc of gadoteridol (ProHance; Bracco Diagnostic, Milan, Italy) at a flow rate of 4 cc/s were automatically injected during the rotational acquisition. The excellent quality of the reformatted 3D images allowed an optimal analysis of the A2 aneurysm, which was embolized suc-

Figure 1 3D Gadolinium digital substraction angiography. "Clips and coïls" reconstruction. The vascular clip positioned 25 years ago is visible in the right sylvian fissure. Left carotid 3D angiography revealed a 80% occlusion of the left middle cerebral artery aneurysm. The distal middle cerebral artery is dysplasic. A saccular aneurysm of the A2 portion of the left anterior cerebral artery is also well demonstrated. Changes in the supra petrous internal carotid artery evoke an old internal carotid dissection.

cessfully with GDC coils. A slight decrease of the creatininemia was observed a few days later (266 to 174 micromol/l). The patient recovered progressively and was finally discharged two weeks later.

Discussion

Gadolinium chelates are almost exclusively utilized in magnetic resonance imaging. In recent years, they have also been proposed and used as alternative contrast media for DSA when a contraindication to iodinated agents exists [3-12].

In several studies, tolerance to Gadolinium was excellent, and its adverse effects (*e.g.* nausea, hives, anaphylactoid reactions [13]) were much rarer than those of iodinated contrast agents [4-6, 14]. Gadolinium chelates are considered non-nephrotoxic when injected at a recommended quantity [7]. After an intravenous or intra-arterial injection, a decrease of creatininemia is frequently observed, as in our case, and is explained by the hyperosmolarity of the solution of Gadolinium chelates.

Gadolinium is a rare heavy metal and has a natural radio-opacity. It is, however, proposed and distributed as a diluted solution of Gadolinium chelates for magnetic resonance imaging, and shows in this form, a radio-opacity fifteen times less important than a 300 mg/I/ml concentrated iodinated contrast agent. Therefore, Gadolinium is not able to allow conventional angiographic qualitative results as good as iodinated contrast media, but has been reported to be an acceptable alternative contrast agent in DSA, and especially cerebral DSA [10].

Nevertheless, to our knowledge, 3D-Gadolinium-DSA has never been reported in the literature in the work-up of cerebral aneurysms. However, this simple alternative technique should be known: in our patient with renal insufficiency, it disclosed two aneurysms, allowing very precise study of their dimensions (*i.e.* necks and domes) and their relations to parent vessels and adjacent branches, and finally allowed a successful endovascular embolization.

Gadolinium-DSA and 3D-Gadolinium-DSA

need several doses of solution of Gadolinium chelates and their relative high cost could be a disadvantage.

Nevertheless, when non-invasive techniques are not sufficient or when a patient with iodine contra-indication requires an endovascular therapy, using Gadolinium as a contrast agent becomes cheaper than regular iodinated DSA, potentially added to the treatment of acute or chronic renal failure (including dialysis), or even resuscitation and adequate hospitalization in an intensive care unit.

Conclusions

We reported in this article the feasibility of a cerebral 3D-DSA with Gadolinium as a contrast agent in a patient with renal insufficiency and acute subarachnoid hemorrhage, in whom we found and embolized two cerebral aneurysms. This confirms that a solution of Gadolinium chelates is a powerful alternative contrast agent for cerebral DSA or 3D-DSA in patients with contra-indications to iodinated contrast material.

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